AMENDMENTS TO THE TITLE:

Please amend the title to read as follows:

--METHOD AND APPARATUS FOR VACUUM FLUSHING OF AN INJECTOR FOR INTERNAL COMBUSTION--

AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 03/03236 filed on September 29, 2003.

[0000.6] BACKGROUND OF THE INVENTION

[0000.8] Field of the Invention

Please replace paragraph [0001] with the following amended paragraph:

[0001] The invention relates to a method **for rendering a fuel injection valve operationally ready for use in an internal combustion engine.** ~~as defined by the preamble to claim 1.~~ The invention is particularly important in common rail injectors. ~~An injector of this kind, which does not itself cause any pressure increase but instead is supplied directly with the fuel under pressure for injection into the engine, in particular a diesel engine, reacts sensitively to air components in the medium processed by the injector. This medium in the case of an operationally ready diesel engine is diesel fuel, but in the testing field, the testing medium in measurement and testing of the injector is typically not diesel fuel but rather a hydraulically similar material that is preferably noncombustible. Air inclusions in the injector, which are~~

~~present when the injector is filled with the medium before it is put into operation, must be flushed out to a low-pressure connection (leakage connection) of the injector via the volumetric flow of the return quantity of the medium that results during normal operation, for instance from leak fuel quantities and/or from the actuation of a control valve.~~

Please add the following new paragraphs after paragraph [0001]:

[0001.2] Description of the Prior Art

[0001.4] An injector of the with which this invention is concerned, which does not itself cause any pressure increase but instead is supplied directly with the fuel under pressure for injection into the engine, in particular a diesel engine, reacts sensitively to air components in the medium processed by the injector. This medium in the case of an operationally ready diesel engine is diesel fuel, but in the testing field, the testing medium in measurement and testing of the injector is typically not diesel fuel but rather a hydraulically similar material that is preferably noncombustible. Air inclusions in the injector, which are present when the injector is filled with the medium before it is put into operation, must be flushed out to a low-pressure connection (leakage connection) of the injector via the volumetric flow of the return quantity of the medium that results during normal operation, for instance from leak fuel quantities and/or from the actuation of a control valve.

Please replace paragraph [0002] with the following amended paragraph:

[0002] The air, present in the gas phase, has much greater compressibility than the liquid medium, and as a result the dynamic damping behavior in the injector, in particular in a magnet valve, is influenced in a nonreplicable way and has a direct effect on the injection quantity. This makes measurements more difficult in the testing field. In the case of a vehicle

that has a diesel engine and is ready for operation and in which an injector has for instance just been replaced in ~~the~~ **a** repair facility and is filled for the first time with diesel fuel, the existing gaseous air once again causes nonreplicable injection events, which for a brief time can make driving feel uncomfortable and make it impossible to meet the required values for exhaust gas. Dissolved air contained in the medium is not considered problematic in this particular application, as long as the air remains dissolved during the entire operating state of the injector and does not become gaseous.

Page 3, please replace paragraph [0006] with the following amended paragraph:

[0006] ~~Advantages of the Invention~~

SUMMARY AND ADVANTAGES OF THE INVENTION

Please replace paragraph [0007] with the following amended paragraph:

[0007] The characteristics of the method of the invention ~~as described in claim 1~~ have the effect that the gaseous air, because of the pressure drop, forms such large air bubbles that they cannot stay caught on protrusions of any kind in the injector. As a result, the air is maximally removed, and an unambiguously replicable fill state of the injector in testing in the testing field or in operation in a motor vehicle is quickly reached.

Page 4, please replace paragraph [0009] with the following amended paragraph:

[0009] ~~The~~ **One embodiment of the** apparatus of the invention ~~as defined by claim 4~~ has devices for connecting an injector to a source of high pressure of the medium and to a underpressure connection. A control device with control terminals of switching valves is

advantageous and is also advantageously coupled to a trigger circuit for opening and closing the injection openings of the injector.

Please replace paragraph [0010] with the following amended paragraph:

[0010] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0011] with the following amended paragraph:

[0011] A preferred embodiment of ~~an arrangement with which one type of embodiment of a method of the invention can be realized is shown schematically in the drawing and will be described in further detail in the ensuing description. Shown are~~ **the invention will be more fully described herein below, in conjunction with the drawings, in which**:

Please replace paragraph [0012] with the following amended paragraph:

[0012] Fig. 1[[,]] **is** a hydraulic basic circuit diagram of the arrangement for eliminating air inclusions from a common rail injector, an arrangement that is used both in the testing field, the first time the injection system is put into operation at the automobile manufacturer, or may also be present in a well-equipped automotive repair facility,

Please replace paragraph [0013] with the following amended paragraph:

[0013] Fig. 2[[,]] **is** a longitudinal section through a known stroke-controlled injector for diesel fuel, having a magnet valve, which via an outflow throttle controls the pressure in a control chamber for the sake of actuating a valve piston for opening and closing injection openings; and

Page 5, please replace paragraph [0014] with the following amended paragraph:

[0014] Fig. 3[[,]] **is** a timing diagram of the triggering of the valves V1 through V4.

Please replace paragraph [0015] with the following amended paragraph:

[0015] ~~Description of the Exemplary Embodiment~~

DESCRIPTION OF THE PREFERRED EMBODIMENT

Please replace paragraph [0016] with the following amended paragraph:

[0016] The arrangement [[1]] shown in Fig. 1 schematically shows an injector 2, installed in the arrangement, for common rail operation, having a high-pressure connection 3 for the liquid test medium, which is free of gaseous air. This medium can be supplied from a connection 5, at which the test medium is available at high pressure, via a pipeline 6. In the test field, the injector 2 ~~has been~~ **is** inserted [[into]] **in** the completely empty state, that is, filled only with air, into the arrangement [[1]] [[is]] shown, or with a mixed filling (air and a test medium), for instance in the case of repeated tests.

Please replace paragraph [0018] with the following amended paragraph:

[0018] Leak fuel quantities, which depending on the embodiment of the injector also **produces** a relatively large return quantity that occurs during operation, from the injector **to** flow away from the injector via a connection 13 (low-pressure connection, leakage connection). In this example, this connection is not connected directly to a pipeline, serving for instance as a return line into the fuel tank, but instead to an adaptor head 14, which makes it possible to connect the connection 13 to other connections of the arrangement.

Page 7, please replace paragraph [0023] with the following amended paragraph:

[0023] Via a trigger circuit 7', coupled to the aforementioned control device, a trigger signal is supplied to the electrical terminal 7 and triggers the injector, in this example, in the usual

way for operation of an internal combustion engine; in this example, it does so with 1000 electrical pulses per minute, so that per minute, the control valve 8 executes 1000 opening and closing events. (This is very much faster than the switching frequency of the control valve [[2]] **8**, for instance.) During that time, leakage fluid and control fluid, which occurs in the stroke of the valve piston 12, flows out through the connection 13 and, because of the existing underpressure in the region of the control valve, flushes out air bubbles, which are enlarged compared to normal operation. The flushed-out air bubbles reach the adaptor head 14, where in a preferred embodiment of the method they are flushed out of the adaptor head by flushing medium, which is released by the valve V2 a total of three times in the example shown, and as a result the elimination of air from the vicinity of the injector is reinforced.

Page 8, please replace paragraph [0025] with the following amended paragraph:

[0025] Once the aforementioned arrangement [[1]] as just described has been in operation for a few seconds, for instance, the switching valve V1 (vacuum) will have been closed in the meantime. In this example, this is followed by a single flushing operation as well. The high-pressure supply of test medium via the switching valve V4 is maintained, and the switching valve V3 is opened, so that the now sufficiently air-free medium continuing to emerge from the low-pressure connection 13 of the injector 2 is delivered, given further delivery of the medium to the high-pressure connection 3, through the valve V4 to the collection tank 20, as is provided in normal operation in the motor vehicle, and can be measured (quantified) as needed.

Page 10, please replace paragraph [0030] with the following amended paragraph:

[0030] In the performance of the method of the invention and in the ~~activity~~ **operation** of the apparatus of the invention, the number and in particular the total volume of the air bubbles present in the injector decreases steadily, because new, air-free medium is constantly being supplied to the connection 3, and after a short time, at most after only a few seconds, the injector is practically air-free, and measurements can now be made exactly at the injector.

Please replace paragraph [0031] with the following amended paragraph:

[0031] If the described apparatus [[1]] is to be used for instance in a professional automotive **repair** facility for instance to install a repaired and still air-filled injector in an internal combustion engine, then all that is needed is to connect the above-described system parts to the injector, that is, the adaptor head, and with it the vacuum pump. The supply of high-pressure medium, in this case specifically diesel fuel, already exists in the motor vehicle, without special provisions being required. It may be that in this case difficulties arise in furnishing a low-pressure flushing medium, namely once again specifically diesel fuel. In that case, the adaptor head for use in the professional facility would not have a connection for flushing medium, or that connection would be closed.

Please replace paragraph [0032] with the following amended paragraph:

[0032] It may be practical to free still other injectors, such as injectors of the kind ~~those~~ that put fuel of relatively low pressure at the injection pressure via a built-in compressor, of air inclusions by using the invention.

Page 11, please add the following new paragraph after paragraph [0034]:

[0035] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.